Authors: Chad, Josh

Background/Question/Methods

Conservation and management decisions often require information on interacting processes that can only be obtained through the use of ecological models. We created such a model for the endangered Black-capped Vireo (*Vireo atricapilla*) population on the Fort Hood Military Reservation. Our model, which consisted of three parts, was designed to simulate the potential future impacts on vireo populations of land-use change, fire suppression, and climate-induced increases in fire, as well as the management of a brood parasite, the Brown-headed Cowbird (*Molothrus ater*). We first constructed a habitat suitability model for the vireo using vegetation type and structure (mapped from aerial imagery and LiDAR), plus soil data. Next, we simulated the potential impacts of expanding military activity, fire suppression, and climate-induced increases in area burned on the future availability of vireo habitat using a landscape simulation model. Finally, we used HexSim to develop a spatially explicit vireo-cowbird population model incorporating the effects of brood parasitism and cowbird management. With this model system, we evaluated the long-term importance of cowbird management on vireo abundance, and explored the impacts of military training, fire management, and climate change on vireo populations.

Results/Conclusions

Vireo habitat suitability models performed well across 25 bootstrapped training and test datasets (median accuracy=82%). Landscape simulation scenarios for fire suppression resulted in mean losses of vireo habitat ranging from 14-89% relative to a baseline scenario, whereas climate-induced increases in fire resulted in mean increases in vireo habitat ranging from 51-118%. In simulations run without cowbird management, vireo populations declined below the minimum 1000 breeding pairs mandated by the vireo habitat management plan. Scenarios for fire suppression resulted in mean losses of vireos ranging from 16-66% relative to a baseline scenario, whereas a scenario for increasing fire resulted in mean increase of 54%. This system of linked, empirical and mechanistic models provided a useful framework for exploring the potential future effects of land-use, climate change, and management on the Fort Hood Black-capped Vireo population.